

OBSERVATIONS ON THE POLLINATION IN *NECHAMANDRA ALTERNIFOLIA* (ROXB.) THW.

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ABSTRACT

While studying the ecology of low lying lands in and around Calcutta, some observations were made on the mechanism of pollination in *Nechamandra alternifolia*, a common aquatic herb of Hydrocharitaceae. The mode of pollination in this plant indicates that the phenomenon is little influenced by the surface depression formed by tepals of the pistillate flowers. It takes place by the direct contact of the anthers of the floating male flowers on a calm surface of water with the stigmatic lobes of the female flower.

INTRODUCTION

While studying the ecology of low lying areas in and around Calcutta, some observations were made on the mechanism of pollination in *Nechamandra alternifolia* (Roxb.) Thw., a common aquatic herb of Hydrocharitaceae. Pollination mechanism for some members of Hydrocharitaceae have been described by Svedelius (1904), Wylie (1904, 1917), Kausik (1939) and Ernst-Schwarzenbach (1945, 1956). Except for some brief notes the mode of pollination in *Nechamandra alternifolia* (Roxb.) Thw. has not been described so far; the present account relates to observation on the mode of pollination in this species.

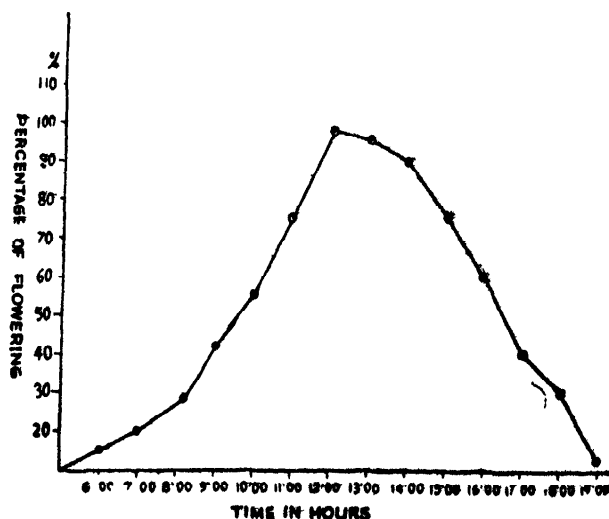
The plants form a dense population and occur commonly in ditches, shallow water depressions around rice fields, choked canals and stagnant pools in association with species of *Hydrilla*, *Ceratophyllum*, *Najas* and *Nymphoides*. Generally they inhabit the fresh water and their growth is profuse in brackish stagnant water. The pH of the medium ranges generally from 6.9-8.2.

OBSERVATIONS

Anthesis of staminate flowers: As the bifid spathe opens, the staminate flowers break off acropetally from their attachment and rise up to the water surface. This occurs usually during day time. During photosynthesis the oxygen that is released accumulates in the intercellular spaces of the tissues and gradually escapes around the cluster of staminate flowers which are surrounded by the spathe. Ultimately, pressure caused as a result of the accumulation of this gas, forces the spathe to open. Similar observation had been made in the staminate flowers of *Elodea canadensis* Michx. (Wylie, 1904). This is noticed only in the fully developed inflorescence and not in the developing inflorescence. In each flower, the gas also occurs in the space formed by the enclosed perianth parts. The opening of the spathe followed by the release of a large number of air bubbles help in the detachment of the small staminate flowers from their axils. They are fur-

ther acted by the buoyancy of the enclosed gas and its low density. This enhances the detachment of compactly arranged unopened flowers which in turn gradually raise to the surface along with the escaping air bubbles.

The release of the staminate flowers and their opening begins from 9.00 A.M. and continues upto 5.00 P.M. during day time; sometimes a few flowers were released late in the evening. The maximum number of staminate flowers open between 11.00 A.M. to 3.00 P.M., 12 noon being the peak hour. Observations were made on bright days to record the percentage of flowering in staminate flowers in quadrats of 1 sq. ft area of water surface and the data is presented in the following table. The percentage of flowering is shown in the form of a graph.



The gradual increase in the intensity of sunlight appears to influence the enclosed gas to expand which in turn helps the flowers to burst open. Soon with the release of the gas, tepals snap back quickly. Thus the recurved tepals from three boat like floats and these support the two stamens just above the surface of water. They now appear in the form

TABLE

Sl. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Time in hours	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	17.00	18.00	19.00
Flowering % (approx.)	5	20	28	40	55	75	98	96	90	75	60	40	30	2

of innumerable silvery white specks and skim on the entire water surface.

In such fully opened staminate flowers, the two stamens assume a diverging position. Later, the filaments take a horizontal position with their distal ends projecting out of the perianth lobes. As these changes are going on the globose anthers dehisce transversely and the pollen grains remain loosely attached along the distal part of the projecting filaments. The mature pollen grains are tricolpate, have a spinescent exine and are three celled.

Anthesis of the pistillate flowers: The sessile pistillate flowers which grow in axils of the obliquely floating branches, have an inferior ovary and bear filiform perianth tubes of varying lengths. This variation in their length is due to the disposition of these flowers in relatively different depths of water.

After emerging from the spathe the perianth tubes of these female flowers lengthen; soon their unopened tips reach the surface of water by a further lengthening of the slender perianth tubes. On reaching the water surface the tripartite perianth lobes open exposing the stigmatic lobes. The three tripartite lobes of the stigma now slightly arch towards the periphery to increase their receptive surfaces. The spreading, orbicular perianth lobes also help in the protection of the stigmatic lobes from not being wetted. The long slender appendicular perianth tube noticed in this species can be compared with the filiform pedicels noticed in the pistillate flowers of *Vallisneria*, *Elodea* and *Enhalus*. The perianth as it reaches and touches the water surface does not seem to form the shallow depression as seen in the above species.

Mode of pollen transfer: Innumerable fully opened staminate flowers scud along with the breeze over the water surface and they try to entangle themselves with the cuneate stigmatic lobes by their projecting anthers. At this stage the pollen grains in the dehiscent anthers are found loosely adhering to the split pollen sacs. As the floating staminate flowers approach the stigmatic lobes which are now just peeping over the water level, the projecting anthers directly touch the stigma and by contact mechanism the pollen grains are shed on the stig-

matic lobes. During a heavy breeze, most of the staminate flowers in contact with the stigma are swept apart. On onset of a quieter period a fresh lot of staminate flowers take the chance for shedding their contents. Thus there is every likelihood of all the pistillate flowers being pollinated.

After a period of rest a large number of pollen grains germinate, on the stigma and the pollen tubes traverse through the stylar canal. Intracarpellary pollen grains were observed in one instance by Mr. V. Abraham (unpublished data).

CONCLUSION

Goebel (1889-91) noticed the mode of detachment of staminate flowers in *Vallisneria alternifolia* Roxb. which is a synonym of *Nechamandra alternifolia* (Roxb.) Thw. and concluded that the mode of pollination in this plant was similar to *Vallisneria spiralis* Linn. Svedelius (l.c.) also agreed with this observation, however, did not describe the mode of pollen transfer. While comparing this phenomenon with *V. spiralis* Linn. he emphasised the formation of a surface depression for effective pollination.

In *Elodea canadensis* Michx., *Vallisneria spiralis* Linn. and *V. americana* Michx. the formation of surface depression has an effective role in pollination. Wylie (1904) while discussing the pollination mechanism in *Elodea canadensis* Michx. has remarked on the formation of a surface depression about each flower into which slide the floating pollen grains. According to Wylie (1917) and Kausik (l.c.) the surface depression plays a prominent role during pollination in *Vallisneria spiralis* Linn.

The present account of pollination in *Nechamandra* differs from other genera of the Hydrocharitaceae in that the pollen transfer takes place by the direct contact of the anthers with the stigma. Pollination is little influenced by contact depressions. The horizontal position of the stamens appear to be best suited for the immediate and direct contact with the fringed margin of the stigmatic lobes which lie just above the surface of water.

Svedelius (1932) mentions that *V. americana* Michx. and *Enhalus acoroides* Zdl. form a transition type in pollination ecology between *epihydrogamic* (where staminate flowers are carried to pistillate flowers) and *hypohydrogamic* (where pollen

grains are carried to the stigma below the water level by the toppling down of the staminate flowers) types. *Nechamandra* is thus epihydrogamic and there is no formation of a surface depression. The pollination mechanism in this species is thus not exactly similar to *Vallisneria* which is widespread in the warmer parts of the world.

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